SUPERFUND INTERIM CLOSE OUT REPORT
GENERAL MILLS/HENKEL SUPERFUND SITE
MINNEAPOLIS, MINNESOTA

I. Summary of Site Conditions

Background

The General Mill/Henkel Superfund site is located at 2010 East Hennepin Avenue in Minneapolis, Minnesota. The 10 acre facility was a technical research facility from 1930 to 1977 conducting both food and chemical research. From 1947 through 1962, a soil absorption pit which consisted of a series of three stacked, perforated 55-gallon drums buried 10-12 feet beneath the soil surface was used to dispose of laboratory solvents. General Mills has estimated that up to 1000 gallons of solvents were discharged into the waste pit annually from 1947 to 1962.

The General Mills/Henkel site was placed on the National Priorities List on September 21, 1984.

Remedial Planning Activities

In June 1981, General Mills notified the Minnesota Pollution Control Agency (MPCA) that they intended to investigate the soil absorption pit. Eleven soil borings were drilled at the site and results from three borings showed elevated levels of volatile organic chemicals. The analysis showed the presence of benzene, toluene, xylene, methyl isobutyl ketone, ethylbenzene, methylene chloride, 1,1,1 trichloroethane, 1,1,2,2 tetrachlorethane, 1,1,2 trichlorethane, 1,1,2,2 tetrachloroethylene, chlorobenzene, and trichloroethylene. In 1983, three additional borings were drilled in the areas that showed significant contamination in 1981 and one boring exhibited elevated levels of VOC's.

Sixteen groundwater monitoring wells were installed in 1982, seven additional wells in 1983 and four in 1984. A wide variety of volatile organic chemicals have been present in the monitoring wells, but trichloroethylene has overshadowed all other constituents present. Two aquifers underlying the site are contaminated, the surface or glacial drift and the Platteville formation (Carimona and Magnolia Members). A generalized geologic cross section is shown in Figure 1.

General Mills analyzed different alternatives in 1983 to address site contamination in a document called "Summary of Alternative Remedial Actions". The following is a list of the different alternatives:

1. No action.

2. Excavation of contaminated soils in the vadose zone.

3. 45-foot diameter excavation of contaminated soils to a depth of 30 feet (vadose and saturated zone).

4. 70-foot diameter excavation of contaminated soils to a depth of 30 feet (vadose and saturated zone).

5. Venting of the vadose zone in conjunction with a groundwater pumpout system.

6. Groundwater pumpout system.

7. Slurry wall and cap.

8. Soil washing in conjunction with a groundwater pumpout system.

The groundwater pumpout system was chosen since the other options would not eliminate the need for, or significantly reduce the operating time for the groundwater pumpout system. The decision to use a groundwater pump out system was finalized on October 23, 1984 through a Consent Order between General Mills and the MPCA.

Remedial Construction Activities

In 1985, a total of six groundwater extraction wells were installed by General Mills to remediate the groundwater. Three of the six extraction wells are used to extract contaminated groundwater from locations downgradient from the site and within the glacial drift aquifer with the remaining three extraction wells placed on the General Mills site.

The downgradient glacial drift pump out wells are designed to contain and remove groundwater with trichloroethylene (TCE) concentrations exceeding 270 ug/l. The downgradient glacial drift groundwater is discharged to the Minneapolis Storm Sewer for eventual discharge to the Mississippi river. The pumpout wells began operation on December 5, 1985.

Three groundwater extraction wells were installed on the General Mills site and began operation on November 1, 1985. Two of the onsite extraction wells remove groundwater from the glacial drift aquifer and one onsite well removes groundwater from the Carimona member aquifer. The groundwater from the three onsite extraction wells is pumped to an onsite air stripper for treatment. The air stripper is presently treating approximately 150 gallons per minute with an efficiency of 99 percent. The treated groundwater is regulated by a State National Pollution Discharge Elimination System (NPDES) permit. Required effluent concentrations at the point of discharge into the Minneapolis storm sewer network are to contain less than 50 ug/l of TCE based on an annual average and less than 100 ug/l of TCE as a daily maximum.

Two additional groundwater extraction wells have been installed onsite by General Mills and will become fully operational in June 1992 to remediate the Magnolia member aquifer. Pursuant to the Consent Order between General Mills and the MPCA, additional groundwater extraction is required if monitoring wells in the Magnolia member aquifer showed TCE concentrations greater than 27 ug/l. The groundwater extracted from the Magnolia member aquifer will be discharged into the Minneapolis storm sewer network. The NPDES permit has been amended and reissued to include provisions for the new discharge into the storm sewer network from the Magnolia member aquifer extraction wells.

Fencing surrounding the site to prevent access has been in place prior to the investigation beginning in 1981 since the facility was an operating research laboratory.

Community Relations Activities

The MPCA has kept the community informed throughout the project. A fact sheet was published on the General Mills site in July 1991 and on August 7, 1991, the MPCA held a public meeting to discuss the addition of the two extraction wells in the Magnolia member aquifer. The General Mills site has been the object of minimal community interest and the community is satisfied with the progress of the cleanup.

II. Demonstration of QA/QC From Cleanup Activities

The remedial action by General Mills has been reviewed by the MPCA to determine if General Mills followed quality assurance/quality control (QA/QC) procedures and protocol. Groundwater monitoring QA/QC is described in the Groundwater Monitoring Quality Control/Quality Assurance Plan dated February 1985. Presently, groundwater samples are analyzed by U.S. EPA Method 601/602 and U.S. EPA Method 624, including tentatively identified compounds.

The QA/QC program utilized by General Mills throughout the remedial action has been sufficient to verify that the data generated is accurate and satisfies the requirements of the Consent Order.

III. Monitoring Results

The groundwater monitoring network presently in place consists of the following:

1. Glacial Drift - Ten monitoring wells are sampled in the second quarter for eight VOC's and five of the ten wells are sampled during the fourth quarter for TCE.

2. Carimona Member - Twelve monitoring wells are sampled

in the second quarter for eight VOC's and five of the twelve wells are sampled during the fourth quarter for TCE.

3. Magnolia Member - Five monitoring wells are sampled in the second quarter for eight VOC's and four of the five wells are sampled in the fourth quarter for TCE.

4. St. Peter - Four monitoring wells are sampled in the second quarter for eight VOC's and one well of the four is sampled in the fourth quarter for TCE.

5. Prairie du Chien - One monitoring well is sampled during the second and fourth quarters for eight VOC's.

6. On-site Pumpout Wells - Three pumpout wells are sampled quarterly. The samples in the first and third quarter are analyzed for TCE with a longer list of VOC's analyzed in the second and fourth quarters.

7. Groundwater Treatment System - Samples are taken quarterly from the effluent of the groundwater treatment system. The samples in the first and third quarter are sampled for TCE with a longer list of VOC's analyzed in the second and fourth quarters.

8. Downgradient Pumpout Wells - The three pumpout wells are sampled quarterly. The samples in the first and third quarter are analyzed for TCE with a longer list of VOC's analyzed in the second and fourth quarters.

9. Magnolia Pumpout Wells - The two pumpout wells will be sampled quarterly. The samples in the first and third quarter, beginning mid 1992 will be analyzed for TCE with a longer list of VOC's analyzed in the second and fourth quarters.

Figures 2 through 4 and Tables 1 through 7 show monitoring well locations and 1991 monitoring well results for the glacial drift monitoring wells, Carimona member monitoring wells, Magnolia member monitoring wells, St. Peter monitoring wells, Prairie du Chien monitoring wells, onsite pumpout wells, groundwater treatment effluent, downgradient pumpout wells, and one Magnolia member pumpout well prior to operation.

The established monitoring network has been effective in delineating the groundwater plume. The two recent groundwater extraction wells installed in the Magnolia member aquifer have been added due to the effectiveness of the monitoring network. The groundwater extraction and treatment will continue pursuant to the Consent Order between MPCA and General Mills until groundwater is under 270 ug/l of TCE in the glacial drift aquifer

and under 27 ug/l of TCE in the Carimona member aquifer. As discussed previously, the Magnolia member aquifer action level is 27 ug/l of TCE. The actions levels have not reached, but if in the future the action levels are achieved, General Mills can submit a modification of the pumping procedures to MPCA for review.

This Interim Close Out Report will be amended when groundwater cleanup levels are achieved. The Interim Close Out Report and the amendment together will constituent the Final Close Out Report for the General Mills/Henkel site.

IV. Summary of Operation and Maintenance

Operation and maintenance at the General Mills/Henkel site is performed by a consultant hired by General Mills. The treatment system, extraction wells, sampling events, and security are included in the operation and maintenance and the annual report summarizes the yearly activities.

V. Summary of Five-Year Review Status

Consistent with the requirements of OSWER Directive 9355.7-02 (Structure and Components of Five-Year Reviews, May 1991), a five-year review(s) is appropriate at the General Mills site. The Directive provides that EPA will conduct five-year reviews as a matter of policy of sites where no hazardous substances will remain above levels that allow unlimited use and unrestricted exposure after completion of the remedial action, but the cleanup levels specified in the ROD will require five or more years to attain. This site will be subject to a five-year review in 1993.

Based on the five-year review, U.S. EPA, in consultation with the State of Minnesota, will determine whether human health and the environment are being protected by the remedial action being implemented. U.S. EPA, in consultation with the State of Minnesota, will develop an acceptable and detailed work plan consistent with OSWER Directive 9355.7-02 for the five-year reviews.

VI. Protectiveness

The site does not currently pose a direct threat to human health since the groundwater is not used for consumption and access to the site is prevented. However, the remedy cannot be said to be

fully effective until the groundwater cleanup is completed. This section will therefore be updated in the amendment to this Interim Close Out Report.

Approved By:

JUN 5 1992

Valdas V. Adamkus
Regional Administrator

Date

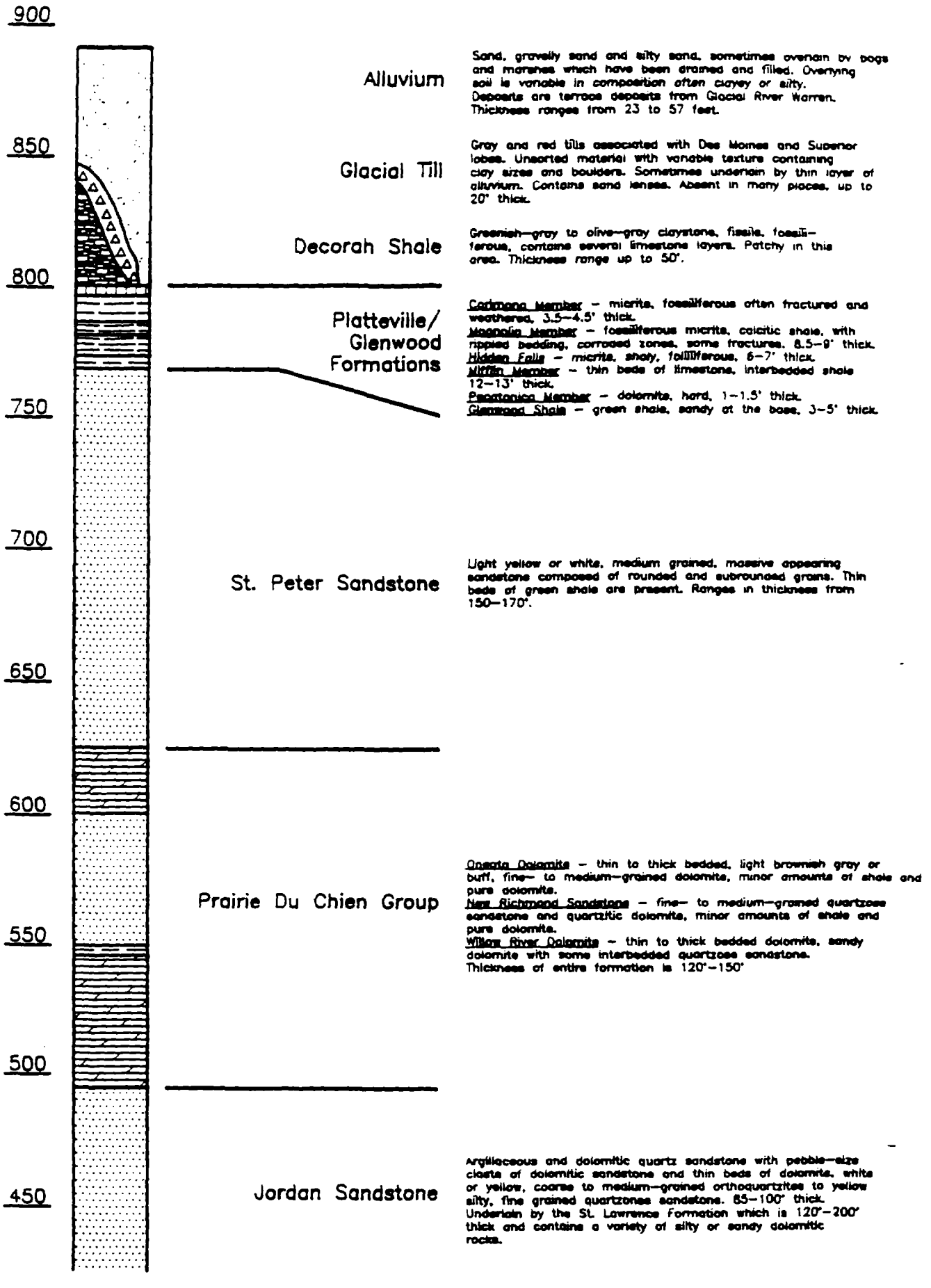

Figure 1

GENERALIZED GEOLOGIC COLUMN

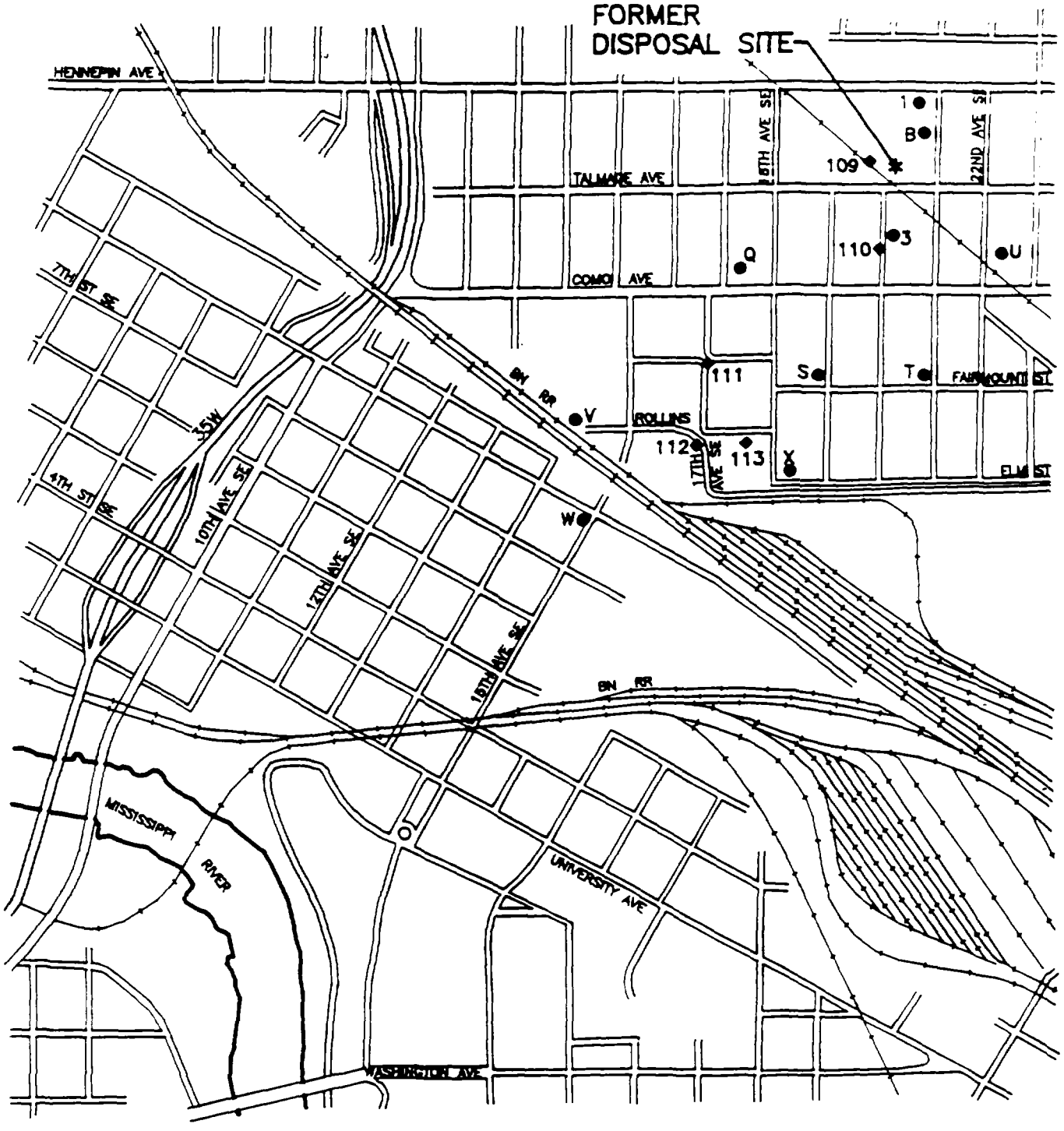

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Figure 2-

GLACIAL DRIFT AQUIFER
1992 MONITORING LOCATIONS

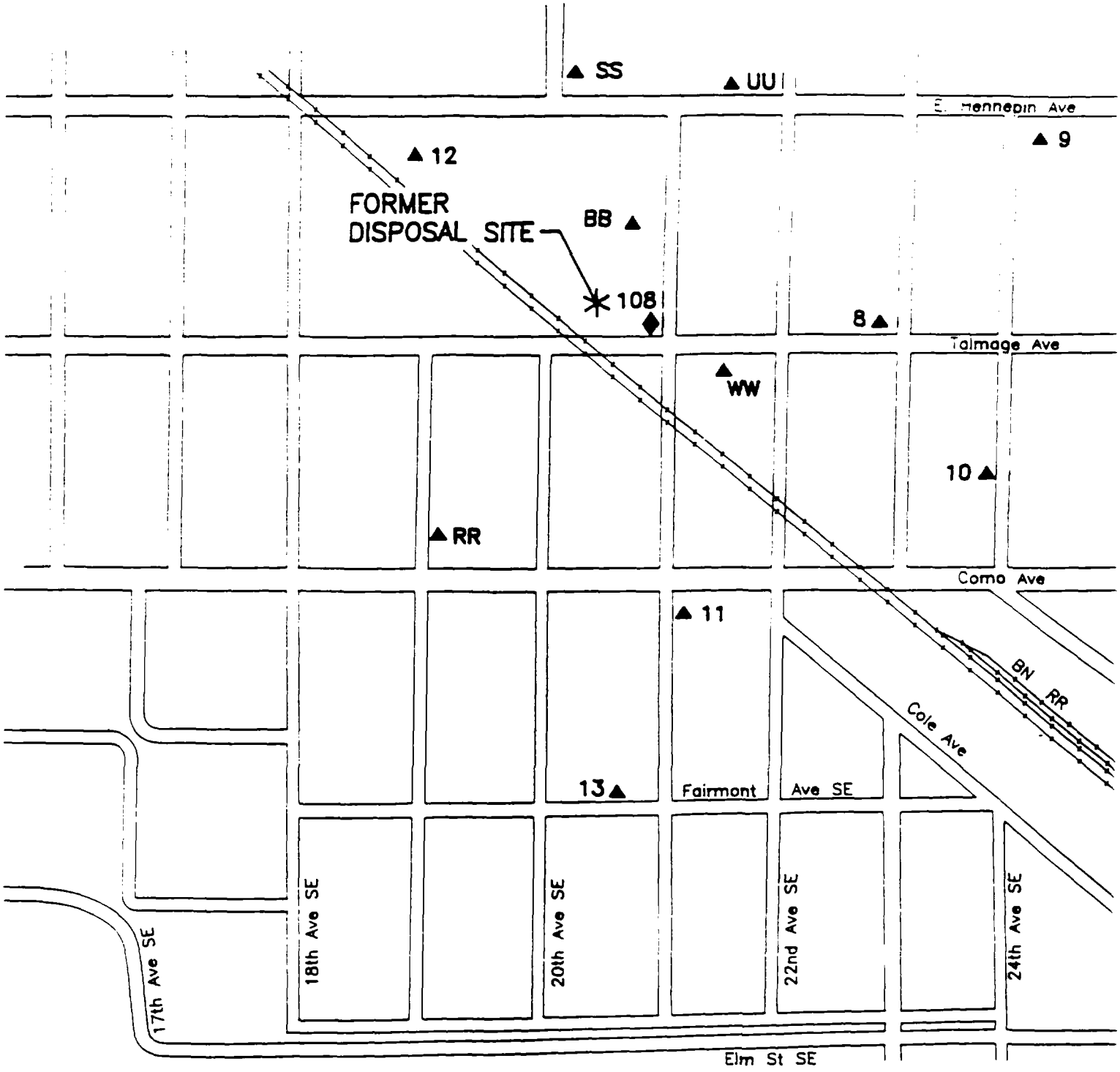

Figure 3

CARIMONA MEMBER
1992 MONITORING LOCATIONS

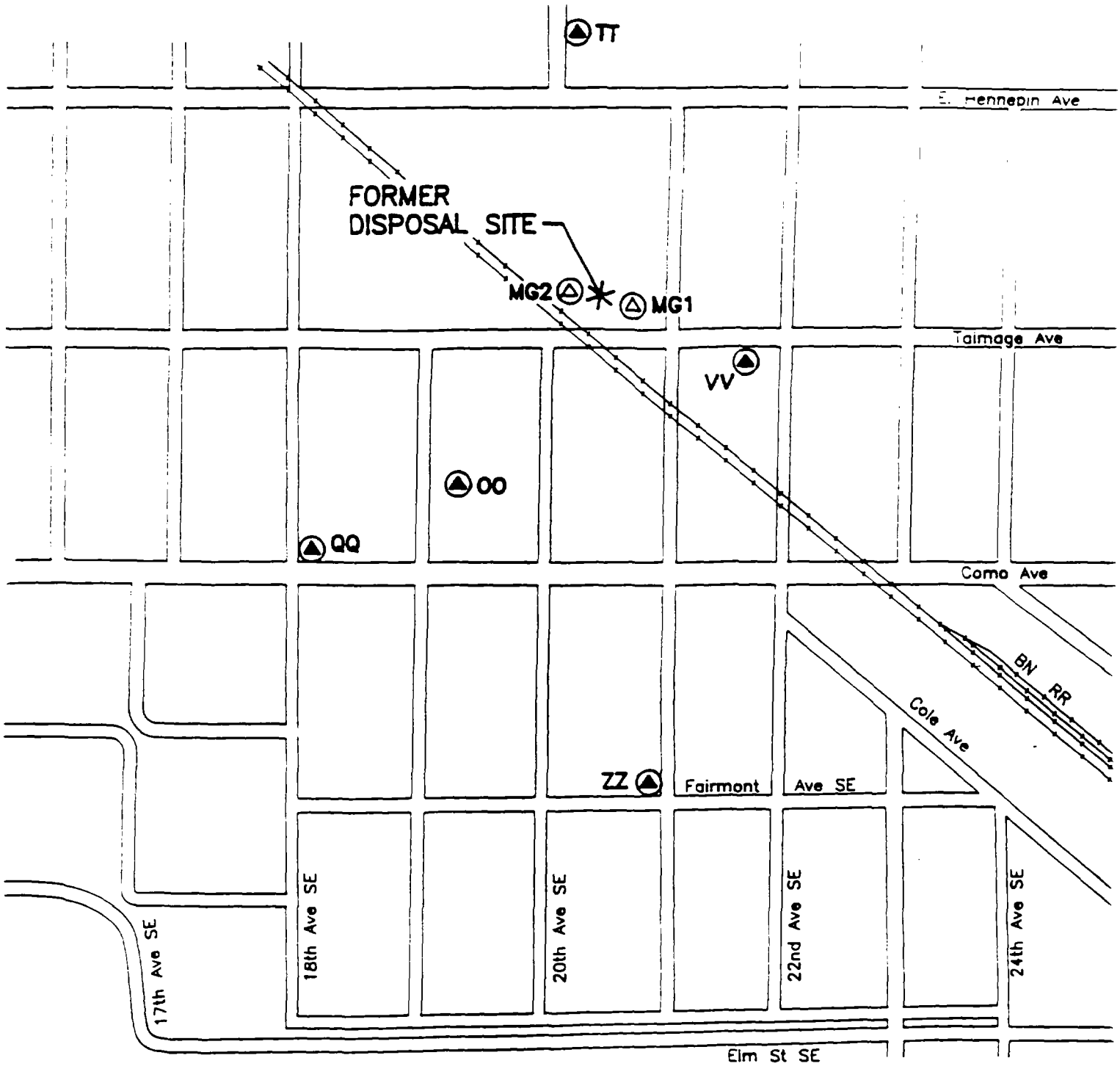

Figure 4

MAGNOLIA MEMBER
1992 MONITORING LOCATIONS

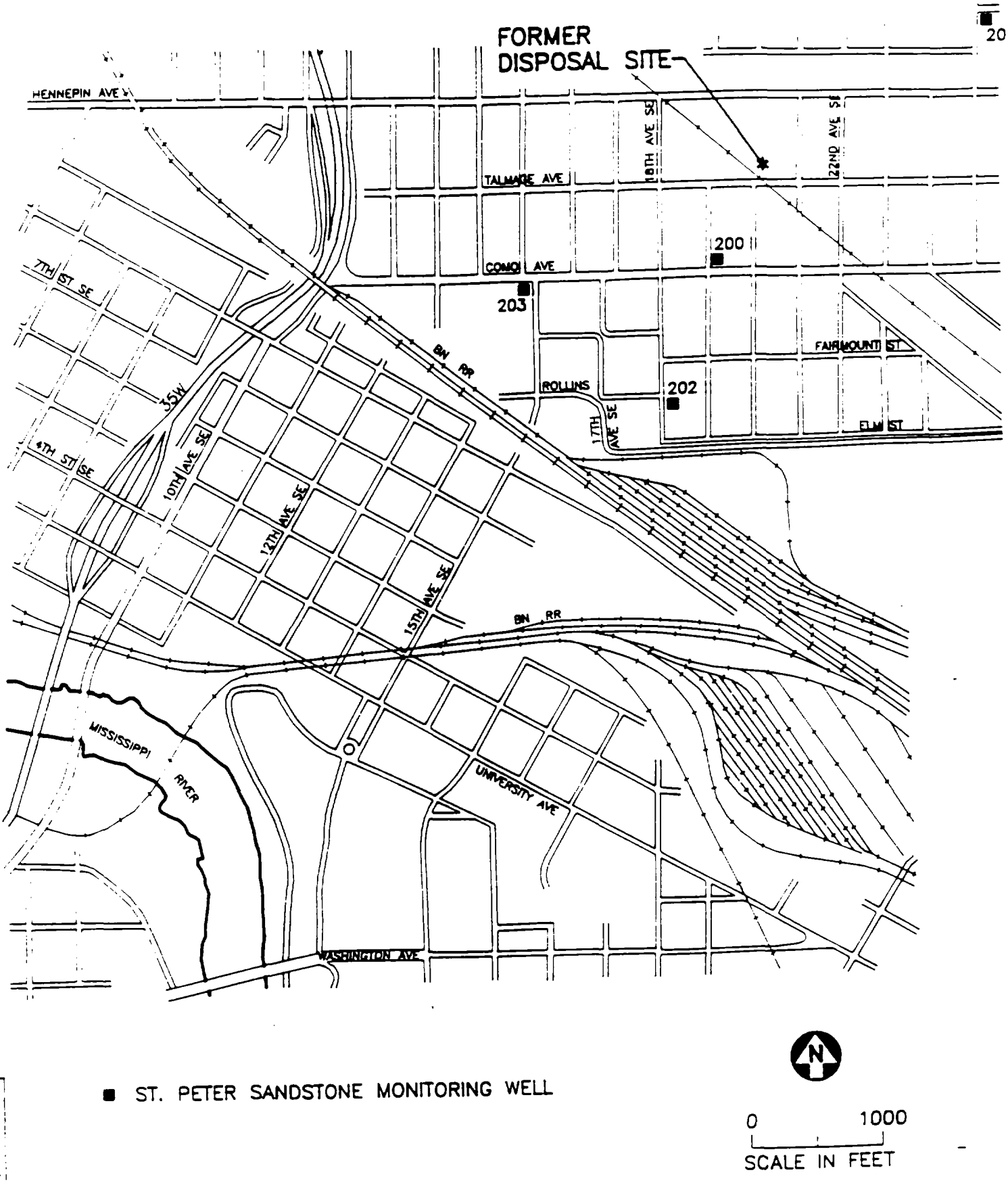

Figure 5

ST. PETER SANDSTONE
1992 MONITORING LOCATIONS

TABLE 1

1991 WATER QUALITY DATA
GLACIAL DRIFT WELLS

(concentrations in ug/L)

Well	B	Q	S		T	U	V	
	04/03/91	04/02/91	04/03/91	09/26/91	04/02/91	04/02/91	04/03/91	09/26/91
1,1-Dichloroethane	2.2	2.4	0.5	--	<0.5	<0.5	<0.5	--
1,2-Dichloroethylene, cis	2.3	<0.5	27	--	<0.5	<0.5	8.0	--
1,2-Dichloroethylene, trans	<0.5	<0.5	2.2	--	<0.5	<0.5	0.7	--
1,2-Dichloroethane	<0.5	<0.5	<0.5	--	<0.5	<0.5	<0.5	--
1,1,2,2-Tetrachloroethane	<0.5	<0.5	<0.5	--	<0.5	<0.5	<0.5	--
Tetrachloroethylene	6.0	<0.5	5.4	--	<0.5	<0.5	<0.5	--
1,1,1-Trichloroethane	4.3	9.4	1.2	--	<0.5	<0.5	<0.5	--
Trichloroethylene	340	0.7	870	480	<0.5	2.0	130	73
Sum Volatile Organics	360	13	910	480	ND	2.0	140	73

Well	W		X	1		3	
	04/02/91	09/26/91	04/01/91	04/02/91	09/26/91	04/01/91	09/26/91
1,1-Dichloroethane	<0.5	--	--	<0.5	--	11	--
1,2-Dichloroethylene, cis	12	--	--	<0.5	--	32	--
1,2-Dichloroethylene, trans	<0.5	--	--	<0.5	--	<0.5	--
1,2-Dichloroethane	<0.5	--	--	<0.5	--	<0.5	--
1,1,2,2-Tetrachloroethane	<0.5	--	--	<0.5	--	<0.5	--
Tetrachloroethylene	<0.5	--	--	3.4	--	8.3	--
1,1,1-Trichloroethane	<0.5	--	--	<0.5	--	4.3	--
Trichloroethylene	40	20	--	3.1	1.3	1500	300
Sum Volatile Organics	52	20	DRY	6.5	1.3	1600	300

ND Not Detected.
-- Not Analyzed.

.001

TABLE 2

1991 WATER QUALITY DATA
CARIMONA MEMBER WELLS

(concentrations in ug/L)

Well	BB	RR	SS	UU	WW	8
	04/03/91	04/03/91	04/03/91	04/02/91	04/03/91	04/04/91
1,1-Dichloroethane	6.6	2.2	9.3	0.7	2.1	<0.5
1,2-Dichloroethylene, cis	40	15	1.6	7.8	23	1.9
1,2-Dichloroethylene, trans	1.6	<0.5	<0.5	1.8	2.6	<0.5
1,2-Dichloroethane	<0.5	<0.5	<0.5	<0.5	<0.5	0.8
1,1,2,2-Tetrachloroethane	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Tetrachloroethylene	11	0.5	<0.5	<0.5	4.0	1.2
1,1,1-Trichloroethane	7.4	0.9	<0.5	<0.5	2.9	1.0
Trichloroethylene	1100	150	4.5	64	420	80
Sum Volatile Organics	1200	170	15	74	460	85

Well	9		10		11	
	04/04/91	09/26/91	04/04/91	09/26/91	04/03/91	09/26/91
1,1-Dichloroethane	1.5	--	<0.5	--	0.7	--
1,2-Dichloroethylene, cis	<0.5	--	1.8	--	12	--
1,2-Dichloroethylene, trans	<0.5	--	<0.5	--	<0.5	--
1,2-Dichloroethane	3.8	--	<0.5	--	1.6	--
1,1,2,2-Tetrachloroethane	<0.5	--	<0.5	--	<0.5	--
Tetrachloroethylene	<0.5	--	1.0	--	0.6	--
1,1,1-Trichloroethane	<0.5	--	2.5	--	<0.5	--
Trichloroethylene	7.3	10	110	120	8.7	3.2
Sum Volatile Organics	13	10	120	120	24	3.2

Well	12		13	108	
	04/04/91	09/26/91	04/03/91	04/01/91	09/25/91
1,1-Dichloroethane	<0.5	--	<0.5	3.1	--
1,2-Dichloroethylene, cis	<0.5	--	<0.5	34	--
1,2-Dichloroethylene, trans	<0.5	--	<0.5	1.9	--
1,2-Dichloroethane	<0.5	--	<0.5	<0.5	--
1,1,2,2-Tetrachloroethane	<0.5	--	<0.5	<0.5	--
Tetrachloroethylene	<0.5	--	<0.5	3.4	--
1,1,1-Trichloroethane	<0.5	--	<0.5	2.2	--
Trichloroethylene	<0.5	<0.5	<0.5	710	76
Sum Volatile Organics	ND	<0.5	ND	760	76

-- Not analyzed.
ND Not Detected.

.002

TABLE 3

1991 WATER QUALITY DATA
MAGNOLIA MEMBER WELLS

(concentrations in ug/L)

Well	OO		QQ	TT
	04/03/91	09/26/91	04/03/91	04/01/91
1,1-Dichloroethane	<0.5	--	<0.5	0.7
1,2-Dichloroethylene, cis	9.1	--	<0.5	6.7
1,2-Dichloroethylene, trans	4.4	--	0.6	<0.5
1,2-Dichloroethane	<0.5	--	<0.5	<0.5
1,1,2,2-Tetrachloroethane	<0.5	--	<0.5	<0.5
Tetrachloroethylene	<0.5	--	<0.5	<0.5
1,1,1-Trichloroethane	<0.5	--	<0.5	<0.5
Trichloroethylene	5.1	5.0	<0.5	140
Sum Volatile Organics	19	5.0	0.6	150

Well	V V		ZZ	
	04/03/91	09/26/91	04/04/91	09/26/91
1,1-Dichloroethane	<0.5	--	0.6	--
1,2-Dichloroethylene, cis	6.0	--	6.4	--
1,2-Dichloroethylene, trans	<0.5	--	1.0	--
1,2-Dichloroethane	<0.5	--	0.6	--
1,1,2,2-Tetrachloroethane	<0.5	--	<0.5	--
Tetrachloroethylene	<0.5	--	0.7	--
1,1,1-Trichloroethane	1.3	--	<0.5	--
Trichloroethylene	75	48	170	30
Sum Volatile Organics	82	48	180	30

-- Not analyzed.

.003

TABLE →

1991 WATER QUALITY DATA
MAGNOLIA MEMBER PUMP-OUT WELL

(concentrations in ug/L)

Well	MG1
	06/07/91
Chloromethane	<1.0
Bromomethane	<1.0
Vinyl Chloride	<1.0
Chloroethane	<1.0
Methylene Chloride	1.7
Dichlorodifluoromethane	<1.0
Trichlorofluoromethane	<1.0
1,1-Dichloroethylene	<1.0
1,1-Dichloroethane	<1.0
1,2-Dichloroethylene, trans	<1.0
1,2-Dichloroethylene, cis	2.6
Chloroform	<1.0
1,2-Dichloroethane	1.0
1,1,1-Trichloroethane	<1.0
Carbon Tetrachloride	<1.0
Bromodichloromethane	<1.0
1,2-Dichloropropane	<1.0
Cis-1,3-Dichloro-1-propene	<1.0
Trichloroethylene	33
Chlorodibromomethane	<1.0
1,1,2-Trichloroethane	<1.0
Benzene	<1.0
Trans-1,3-Dichloro-1-propene	<1.0
Bromoform	<1.0
Tetrachloroethylene	<1.0
1,1,2,2-Tetrachloroethane	<1.0
Toluene	<1.0
Chlorobenzene	<1.0
Ethyl Benzene	<1.0
Xylenes	<1.0
1,3-Dichlorobenzene	<1.0
1,4-Dichlorobenzene	<1.0
1,2-Dichlorobenzene	<1.0
Sum Volatile Organics	38

.010

TABLE 5

1991 WATER QUALITY DATA
ST. PETER SANDSTONE WELLS

(concentrations in ug/L)

Well	200		201	202	203
	04/04/91	09/26/91	04/04/91	04/04/91	04/04/91
1,1-Dichloroethane	<0.5	--	<0.5	<0.5	<0.5
1,2-Dichloroethylene, cis	6.5	--	<0.5	<0.5	<0.5
1,2-Dichloroethylene, trans	<0.5	--	<0.5	<0.5	<0.5
1,2-Dichloroethane	<0.5	--	<0.5	<0.5	<0.5
1,1,2,2-Tetrachloroethane	<0.5	--	<0.5	<0.5	<0.5
Tetrachloroethylene	0.7	--	<0.5	<0.5	<0.5
1,1,1-Trichloroethane	<0.5	--	<0.5	<0.5	<0.5
Trichloroethylene	140	77	<0.5	<0.5	3.0
Sum Volatile Organics	150	77	ND	ND	3.0

ND Not Detected.
-- Not analyzed.

.004

TABLE 6

1991 WATER QUALITY DATA
PRAIRIE DU CHIEN/JORDAN WELL

(concentrations in ug/L)

Well	HENKEL	
	07/11/91	09/26/91
1,1-Dichloroethane	2.2	0.95
1,2-Dichloroethylene, cis	<0.5	<0.5
1,2-Dichloroethylene, trans	<0.5	<0.5
1,2-Dichloroethane	<0.5	<0.5
1,1,2,2-Tetrachloroethane	<0.5	<0.5
Tetrachloroethylene	<0.5	<0.5
1,1,1-Trichloroethane	0.53	<0.5
Trichloroethylene	49	18
Sum Volatile Organics	52	19

.011

TABLE 7

HISTORICAL WATER QUALITY DATA
SITE PUMP-OUT AND TREATMENT SYSTEM
DOWNGRADIENT PUMP-OUT SYSTEM
TRICHLOROETHENE

(concentrations in ug/L)

DATE	(1) DISCHARGE	(2) INFLUENT	(3) EFFLUENT
11/85	160	1200	13
12/85	140	870	12
01/86	--	1100	17
02/86	290	760	8.4
03/86	--	1700	14
04/86	400	860	11
06/86	250	--	--
08/86	350	870	6.7
10/86	190	610	1.0
03/87	320	730	6.8
04/87	170	530	8.3
07/87	310	660	2.8
10/87	230	720	<0.5
11/87	--	490	2.6
01/88	300	470	4.4
04/88	210	370	5.3
07/88	70	160	1.2
10/88	64	--	--
11/88	--	84	3.7
01/89	210	390	9.8
04/89	200	440	13
07/89	170	380	20
10/89	110	--	--
12/89	--	140	190
01/90	140	380	96
05/90	220	370	1.2
07/90	180	310	0.9
10/90	100	360	2.9
01/91	150	430	0.8
04/91	290	890	1.0
07/91	210	370	<0.5
09/91	110	320	<0.5

(1) Flow rate weighted composite sample (pump-out wells 111, 112, and 113)
(2) Flow rate weighted composite sample (pump-out wells 108, 109, and 110)
(3) Effluent from treatment system.
-- Not analyzed.